

# **Safety First: Environmental Compliance and Approvals for Large-Scale Explosive Safety Tests**

by

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The Maritime Pre-positioning Ships test performed at China Lake presents a number of valuable, real-world problems surrounding the planning and development of large-scale explosive tests. This paper examines the scope, level of effort, and complexities involved in achieving environmental compliance while meeting the sponsor's time frames, budgets, and objectives. Lessons learned in this recent example are presented with a view toward their utility for future safety testing.

## **Introduction**

Environmental compliance for large-scale explosive testing is, in many ways, an issue of *safety first*. In these times of rigorous regulatory oversight and growing agency accountability for consideration of environmental issues, much can be gained when test plans and objectives are subjected to a proactive approach to environmental compliance and approval.

The Maritime Pre-positioning Ships Explosive Safety Quantity Distance Test was performed 7 September 1990 at the Naval Air Weapons Station (NAWS), China Lake,

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California. This controlled detonation test presents a number of valuable lessons surrounding environmental compliance and the planning and development of large-scale explosive tests. This paper examines the scope, level of effort, and complexities involved in achieving environmental compliance while meeting the sponsor's time frames, budgets, and objectives.

## Background

Currently, the U.S. Marine Corps operates a number of Maritime Pre-positioning ships (MPSs) in support of the Department of Defense Forward Deployment strategy. As part of the maintenance cycle for the equipment and ordnance located on board these vessels, the vessels are returned every two years to Blount Island on the St. Johns River at Jacksonville, Florida. Equipment is off-loaded, and ordnance is shipped elsewhere for inspection and refurbishing. The ordnance is then shipped back to Blount Island and reloaded aboard the ships. The explosive safety arc for this operation is based on a net explosive weight of 1,500,000 pounds—the projected maximum amount aboard any of the MPSs (Halsey et al. 1991:3).

In August 1990, the Marines were scheduled to begin operating under a new lease at a new location on Blount Island. At the "eleventh hour" in 1989, it was discovered that the explosive safety quantity distance arc for the new facility encompassed several privately owned dwellings across the river channel from Blount Island. With a certain air of immediacy, a study was performed and a test plan prepared to determine if prudent stowage methods existed that could reduce the explosive safety arc. Although this study indicated that stowage arrangements could be used to reduce the maximum credible event, historically these methods have been deemed unacceptable, and gaining approval from the Department of Defense Explosives Safety Board (DDESB) would require a large number of test replications for verification.

Further discussions with DDESB indicated a willingness to accept another approach, using predictions and a large-scale test to determine the "trinitrotoluene (TNT) equivalence" of the net explosive weight aboard the ship. The test would have to be large, approximately one-third of the total shipboard load, and would have to be configured to represent two levels of one hold of the ship. Moreover, the mix of the live and inert munitions used in the test would have to be based on the actual amounts and types of materials found on the ship. This, then, constituted the test plan that was

prepared to conduct an MPS Explosives Safety Quantity Distance test at NAWS China Lake.

## Scope

The scope of this MPS test plan was—in anyone's parlance—enormous. The undertaking called for a test site permitting a controlled detonation study to allow examination of explosive factors such as actual blast force, destructive extent, and distribution patterns of explosive munitions contained and stored under conditions that model those presently employed by MPS. For the purpose of this test, the load out for the MPS PFC *Dwayne T. Williams* was studied in detail and used as a guide for planning the program. Consisting of approximately one-third of the appropriate material located aboard the *Williams*, the test called for a total ordnance weight of 2,265,770 pounds with 523,790 pounds of net explosive weight.

Site plan development required construction of a dirt-bermed, multitiered, two-level detonation platform half-buried below present ground surface to simulate the confinement provided by water surrounding the ship. This arrangement simulated two levels within one hold of the ship, with the lower level (Level 1) resting below the water line. Level 2 represented a level just above the water line.

When the blast force and distribution patterns of the explosive munitions were factored in, the MPS Explosives Safety Quantity Distance Test required an area of roughly 1.8 square miles. From a center point represented by the location of the detonation platform, instrumentation was extended along three vectors for distances of 4,000 feet. This distance represented the computed maximum extent of the debris field projected for this controlled detonation study.

## Environmental Issues

Environmental awareness and compliance with applicable environmental laws and regulations are central to all project planning at NAWS China Lake. The MPS Explosives Safety Quantity Distance Test was no exception. For this test plan to go forward on time and on schedule, it was necessary to initiate an environmental review process (almost) from the moment NAWS China Lake was selected as the location for the test. NAWS China Lake possesses an Environmental Project Office staffed for

precisely this sort of endeavor; its specialists are "mission oriented" and acutely aware of what is necessary to satisfy environmental compliance requirements.

The Environmental Project Office at NAWS China Lake is involved in every facet of environmental compliance, working closely with federal, state, county, and local agencies. These agencies include the U.S. Environmental Protection Agency, Advisory Council on Historic Preservation, and Fish and Wildlife Agency, as well as the California State Historic Preservation Office, Department of Fish and Game, Air Resources Board, and Department of Health Services. Without this expertise onboard at China Lake, accomplishment of the MPS test plan might never have been realized on time.

Nonetheless, safety remained an overriding consideration among the selection factors used in siting the MPS test plan. The most obvious factors included concerns for the safety of personnel and existing range facilities. Less obvious—but no less necessary—were concerns for the safety of wildlife, historic properties, and other land-based resources present at NAWS China Lake. The potential for harm to these resources as a result of the proposed controlled detonation test led directly to the requirements for careful selection in siting the test plan and performance of environmental assessments for each candidate site location.

Over several months (April through June 1990), selecting the actual test site was a seemingly unending process. Five possible locations were selected. Each was evaluated for safety and compatibility with existing range operations and then subjected to preliminary environmental assessment. This process proved to be an excruciatingly time-consuming and labor-intensive exercise, but, in the end, the most suitable location was identified for siting the MPS test plan. By 30 June 1990, the MPS test site was fixed at Airport Dry Lake, a long-established impact range on the Northern Test Complex at NAWS China Lake.

The Airport Dry Lake Impact Range has a 45-year history of use as an aerial target range. Despite Airport Dry Lake's land-use history and general condition, environmental compliance and approval would require ancillary study of natural and cultural resource concerns and the development of a Preliminary Environmental Assessment.

Considering the Sponsor's original time frame (August 1990), precious little time remained to complete the environmental documentation and conduct the MPS test plan on schedule.

## Environmental Compliance

Following selection of the actual test range location for the MPS test plan, what remained was to conduct the necessary environmental studies to support the development of formal documentation (e.g., Preliminary Environmental Assessment) and, through consultation with appropriate regulatory agencies, seek authority and approval to proceed with the MPS test.

Translating the scope and description of this large-scale explosive safety test into the language of environmental compliance was one of the easier tasks associated with obtaining the compliance and approval documentation necessary for the proposed test. For instance, the scope of the project needed simply to be restated in a land-based perspective; the proposed test plan was translated into a nontechnical project description and the test site requirements described in terms of affected acreage. Borrowing from one of the ancillary reports supporting the environmental documentation for this test (Eckhardt and McDonald 1990), such translation reads like this:

This undertaking provides a test site for a controlled detonation study in support of the U.S. Marine Corps Maritime Pre-positioning Ships program. The test will examine actual blast force, destructive extent and distribution patterns associated with a controlled detonation of some 500,000 pounds of explosive material....(T)he Area of Potential Effect (APE) must allow for a radius of some 4,000 feet (1,153.9 acres total area). Within this region, the proposed undertaking consists of the development of an explosive detonation platform (ground zero) that will be excavated to a depth of up to 15 feet, and measure roughly 110 by 170 feet in size. Surrounding ground zero is an operations area measuring some 1200 feet in diameter (25.96 acres, inclusive), and three gauge lines bordered by debris lines radiating from ground zero for distances of roughly 3500 feet each (36.88 acres).

Literature searches, reviews of cultural resource site records, and reviews of existing records and habitat maps covering the region of the Airport Dry Lake Impact Range commenced immediately following this (hopefully) final site selection for the MPS test plan. These processes—and the actual field review and ground surveys of the proposed project—are the grist for development of environmental documentation when the primary issues remaining are those concerned with land-based resource concerns.

Field review of Airport Dry Lake Impact Range and ground surveys for natural resource concerns were initiated on Tuesday, 3 July 1990. Typically this level of field

effort focuses on inventorying all manner of biological information for a given area: plant communities and their composition; precise characterization of habitat zones; and the nature, relative number, and composition of animal life present within the proposed project area. In this case, requirements focused on confirming the nature of previous disruption to the natural environment and making doubly sure that no native species (floral or faunal) of extraordinary value resided within the project's sphere of influence.

Owing to their known distribution and the presence of marginally suitable habitat in the region, the possible presence of two species—Mojave Ground Squirrel and Desert Tortoise—were the primary natural resource concerns for Airport Dry Lake Impact Range. These two species are recognized on state and federal threatened and endangered species lists (respectively), and their presence in the project area, if confirmed, would require lengthy consultation with state and federal regulatory agencies before approval and authority to proceed with the MPS test plan could be obtained.

Within two days sufficient analysis and groundwork had been conducted to ensure that implementing the test plan in this region would have no adverse impact to sensitive natural resources, and the absence of threatened and endangered species within the project area precluded any potential for inadvertent "taking" of a listed species.

Cultural resource assessment for the MPS test plan at Airport Dry Lake Impact Range was initiated on Monday, 2 July 1990. The National Register of Historic Places was consulted, and no listed or nominated sites were identified within the project's sphere of influence. Archaeological site records and an index of cultural resource surveys maintained by the Resources Management Branch for NAWS China Lake were consulted, resulting in a determination that a portion of the project area had been previously examined, but that no cultural resources were encountered. One previously recorded site (CA-Iny-2532), located just outside a one-mile radius from the project area, was noted in the archaeological records search. Records described this as a small petroglyph (rock art) site recorded in 1966. The potential for discovery of significant cultural resources within the project area was considered to be low, judging by the general terrain, the large areas of disturbed surface, and the results of the previous survey.

Vertebrate fossil remains had been excavated in the 1930s and 1970s from locations near Airport Dry Lake, including Pleistocene Lake China (Davis et al. 1978), the western

escarpment of the Coso Range (Schultz 1937; Van Huene 1971), and directly south of Airport Lake in the White Hills (Van Huene 1971; Fortsch 1972). There remained a high probability of uncovering fossil remains during construction of the dirt-bermed pit in which the explosives would be detonated, although the placement of the detonation platform away from the Airport Lake shoreline and the badlands area of the White Hills lowered that probability somewhat.

Cultural resource surveys were initiated on 9 July 1992. A two-person team intensively surveyed the proposed MPS test plan project area. Field methods consisted of walking transects at 30-meter intervals (northwest/southeast) across the entire project area. No vertebrate fossil remains and no prehistoric or historic archaeological sites were located during this surface inventory effort. The inventory resulted only in the discovery of two isolated finds: a single obsidian flake in a braided streambed channel bottom, and two bifacial thinning flakes of obsidian in a zone of previously debrushed alluvium. All three obsidian flakes were extremely weathered and exhibited edgework indicative of tumbling and alluvial transport.

In addition to the survey of the proposed project area, the cultural resource inventory included a detailed examination of site CA-Iny-2532, the previously recorded rock art site located to the west and outside the project area. This examination revealed that the site was much larger than originally recorded, possessing numerous other cultural elements in addition to the petroglyphs; however, it was found to be contained entirely outside of the proposed project area. Certainly these new findings would warrant more thorough examination and re-recording of site CA-Iny-2532 in preparation for a reconsideration of the site's National Register eligibility sometime in the foreseeable future.

The results of the cultural resource inventory were assessed, and the surface of the proposed project area had earned a clean bill of health: no significant cultural resources and no vertebrate fossil remains had been discovered. However, some concern remained over potential buried deposits of either vertebrate fossil remains or prehistoric (e.g., Pleistocene) human occupations that might be uncovered during construction of the detonation platform. And, of course, the reconsideration of site CA-Iny-2532 warranted continued concern for the safety and welfare of this resource.

By close of business on Wednesday, 11 July 1990, the literature reviews and field inventories were completed. A process that might typically take a month or more had been completed in under twelve calendar days, and all efforts were now focused on



completing the documentation and agency consultations necessary to achieve authority and approval to proceed with the MPS test plan.

Within an additional 12 calendar days, environmental documentation and agency consultations were completed. For natural resources, the baseline information, results of the field survey, and documentation of the entire process brought closure to any continuing concerns for the protection of sensitive natural resources. Cultural resources presented a slightly more complex process. Because of the continuing concerns for potential buried deposits and the nearby rock art site, China Lake entered into consultations with the State Historic Preservation Office (SHPO) with recommendations that both during construction of the test platform and after the MPS test plan event, test activities be monitored daily to ensure that no significant cultural resources would be damaged. Working on a "fast track" with SHPO staff, correspondence was forwarded to the SHPO on Thursday, 12 July 1990, and review comments (and authority to proceed) were received back at China Lake the following Monday. The completed environmental documentation, a Preliminary Environmental Assessment, was issued on 24 July 1990. The MPS Explosives Quantity Safety Distance test proceeded on time and on schedule.

## **Lessons Learned**

In truth, one really shouldn't try to conduct a test of this magnitude in this fashion without the dedicated expertise and labor support that was available at NAWS China Lake. Far too much reliance—in terms of resources, finances, and coordinated effort—was placed on China Lake's ability to accomplish the tasks and goals necessary to accommodate the MPS test plan. This particular gamble paid off, but such a gamble can't always be counted on to do so.

No. What is needed in instances such as this is extremely far-sighted preparation and long-lead development of range resources for exactly this sort of test endeavor.

A reorienting of our priorities warrants serious consideration. Typically, once a test plan is conceived and programmed, the priorities are set on funding, procurement, development, and implementation. Where is the concern for environmental compliance? Well, if it's considered at all, it's nominally considered somewhere between development and implementation. In today's milieu, this is entirely unsatisfactory. Even elevating environmental compliance to a second-tier priority, as in the case of this MPS test plan, proved to be too little and—almost—too late. Better to

"take the bull by the horns" and bring environmental compliance right to the top along with conceptual development and programming. In this way, our endeavors in large-scale explosives safety testing can be assured a successful and brilliant future even in times of rigorous regulatory oversight and growing agency accountability.

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